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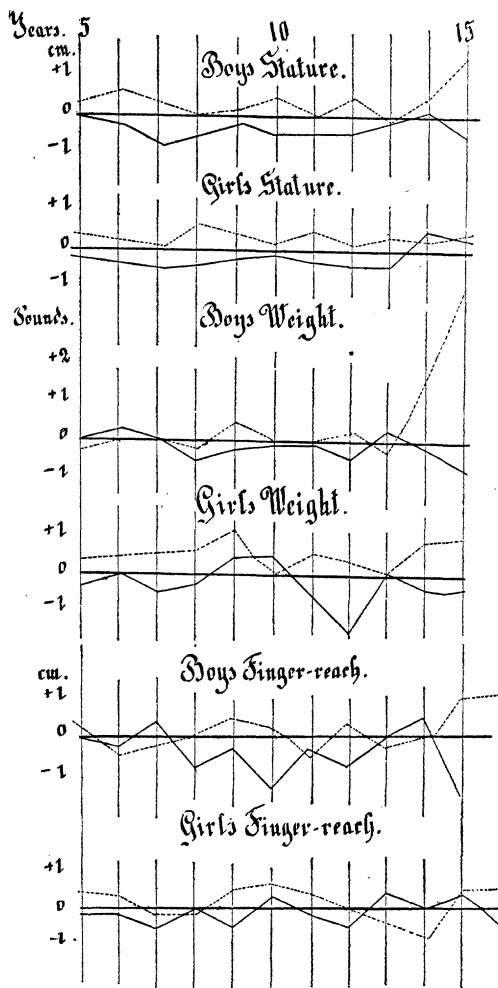
tangibility. An occult impulse to vice is hidden in all vagueness and in all teachings meant to be heard, but not to be understood. Nature is never obscure, never occult, never esoteric. She must be questioned in earnest, else she will not reply. But to every serious question she returns a serious answer. 'Simple, natural and true' should make the impression of simplicity and truth. Truth and virtue are but opposite sides of the same shield. As leaves pass over into flowers and flowers into fruit, so are wisdom, virtue and happiness inseparably related.

DAVID STARR JORDAN.

OBSERVATIONS ON THE RELATION OF PHYSICAL DEVELOPMENT TO INTELLECTUAL ABILITY, MADE ON THE SCHOOL CHILDREN OF TORONTO, CANADA.

In the spring of 1892 Dr. Franz Boas, then of Clark University, Worcester, Mass., obtained the necessary permission from the Toronto School Board to make anthropometric observations upon the school children of that city. The observations were made by the teachers of the various schools upon the children under their immediate charge. The teachers were instructed as to the method of taking the measurements by Mr. A. F. Chamberlain of Clark University, and the subsequent work was carried on under his immediate supervision. The measurements made by the teachers were stature, weight and finger reach. Besides the statistical information regarding age, sex, parentage, etc., the teachers were also requested to group the children as to their mental ability into three as nearly as possible equal divisions of 'good,' 'average' and 'poor.' They were to make their estimate, not on the mere class standing, which would be influenced by such irrelevant matters as regularity and punctuality of attendance, etc., but upon the observed natural intellectual quickness, general aptitude for

assimilation of ideas and initiative. At the same time that these observations were carried on, a similar series of observations was being made in Worcester. There it was soon made manifest that any such classification of children's mental ability would be very greatly influenced by the mental calibre of the teacher making such classification, and in all cases it rested almost exclusively upon the markings of the class book. There was a further fact which was brought



very sharply to my notice, and that was that in most class rooms there were *no poor scholars*. The teachers were perfectly will-

ing to classify the scholars as of 'good' and 'average' intelligence, but any intimation of the presence of 'poor' or stupid scholars was taken as a personal reflection upon the teacher of the class in question. The result was that what was primarily intended for a classification upon the lines of excellence, mediocrity and stupidity became a classification upon the basis of the two first qualities only. What occurred in Worcester was evidently the key to what occurred in Toronto. There also the 'poor' students were no more than a mere handful and had to be disregarded in making up the material from the point of view of the groups 'good,' 'average,' 'poor,' though not with regard to the general average of the city. Between the other two classes the material was quite evenly distributed.

The stature was taken, the child standing erect, heels together and shoes removed, by means of a straight rod marked in centimeters against which the child stood, an arm at right angles to the upright being brought in contact with the top of its head and the scale read at the nearest centimeter. For finger reach the child was required to stand straight, place the middle finger of one hand against the wall and stretch with both arms at their greatest extent along the rod mentioned before, held horizontally at the height of its arm, the arm of the rod being brought in touch with the middle finger of its other hand and the scale read as before at the nearest centimeter. The weight was taken on the ordinary weighing scales in ordinary indoor costume and was recorded in pounds.

The material has been arranged according to sex and age, the children being grouped according to age within the full year, *i. e.*, children between five and six are classed as five years of age. Thus the children are on an average a half year older than the tables represent. The separation into annual groups being made, the various

measurements were then tabulated and the average found. This was done by taking the sum of the observations of one kind within the year and dividing the result by the total number of cases for the same year.

In working up this material it was necessary first to form the general average for each series of observations for the whole school population and then the averages of the two classes of 'good' and 'poor' students. The averages of these two classes were then compared with the general averages.

We have, therefore, in our tables six groups, three for boys and three for girls. Examining the tables we find that the general rule is that the 'poor' children are more fully developed than the 'good' children, though in each series of measurements there are one or two cases where the 'good' children show a higher average than the 'poor.' These cases are generally near the latter end of the series. In the case of girls' stature this is so at fourteen years, of boys' weight at thirteen years, while for girls' weight it is at ten years. In the case of boys' and girls' finger reach, the preponderance of the 'good' is seen at thirteen and fourteen. Again, in boys' weight the 'good' are the heavier from five to seven, inclusive, and the finger reach at six and seven. The most striking difference between the two groups is in the case of stature for both sexes. The 'poor' are the better developed throughout, except, as before noticed, in the case of girls of fourteen and possibly boys of thirteen. There is generally about half an inch difference in the averages of the two groups in favor of the 'poor' students. In the case of weight this difference is not so marked.

The reason for these differences is probably the following: As I have said, the children of 'good' ability were probably so designated from their class standing, and their class standing was undoubtedly in

many cases due to a greater amount of 'pushing' on the part of their parents. This would naturally mean a diminution in the amount of exercise, resulting in decreased rate of growth, while, on the other hand, their more sedentary life would result in a greater relative girth and consequent weight. The weight depending on the stature as well as on the girth, we have the reason for the less marked difference in weight between these two classes than between the same classes in respect to stature. The difference in stature is fairly constant; the difference in weight fluctuates considerably. We see here, from both points of view, the relative effects of insufficient and of proper exercise. On comparing the difference between the two pairs of groups of the girls and the corresponding groups of the boys we find that there is less contrast in the case of the former than in that of the latter. The diagram illustrating the girls' stature is fairly regular in both groups and the difference fairly constant and comparable with that of boys. But when we examine the weight groups we find the girls' diagrams to be much more irregular and the differences much more marked. It is difficult to estimate the cause of this difference, unless it be that the difference in exercise taken by the two groups of girls is more than that taken by the two groups of boys, though the reverse would seem to be most probable. The meaning of the remarkable irregularity of the curves of finger reach is not apparent. The differences in favor of the 'poor' children is due to the fact that the finger reach bears a fairly constant, though not exact, ratio to the stature. This is seen in the general trend of the curves of stature and of finger reach.

On the whole, we may from these observations consider it safe to say that precocity bears an inverse ratio to bodily development. In making this statement, however,

we are directly contradicting the result set forth by Dr. W. Townsend Porter, in his paper on 'The physical basis of precocity and dullness' (Transactions of the Academy of Science of St. Louis, Vol. VI., No. 7). A short discussion will perhaps show the reason for this discrepancy. In the first place, we find that Dr. Porter has grouped his material in two ways; first as to age, and next within the age, as to school grades. In this way he has made the school grade of the pupil the criterion of his mental powers. The policy of this arrangement will be appreciated at once when it is remembered that the school grade of the child depends partly upon the age at which he entered school, *e. g.*, a child who enters the I. grade at nine years of age will naturally not be so far advanced in his studies as a child who enters that grade at six years of age, and who at nine years would naturally be in the IV. grade. Again, it would be necessary to ascertain whether the pupil has been able to attend regularly. The reason of the two children's entrance at the respective ages mentioned might depend upon a variety of causes irrelevant to the question of their mental caliber, as means, health, and, in the case of a large heterogeneous population, knowledge of the language. Any or all of these would serve to determine the child's grade irrespective of its ability. In the material obtained from Toronto this error has been avoided by considering the two questions of school standing in the class and the measurement, and these only. We thus avoid the question of the age at which the child first entered school, and the question whether its attendance has been continuous. Dr. Porter ignores these and evidently proceeds on the hypothesis that all children enter school at the same age and pursue their studies uninterruptedly thereafter, both of which are assuredly far from being the case. Again, while in arranging

his material, he has grouped all children as of the same age who have, *e. g.*, passed their ninth birthday and not yet reached their tenth; he has again ignored the fact that the majority of children enter school at the beginning of the year and not during the term, thus in this way still further throwing out his calculation.

G. M. WEST.

A TWO-HEADED TORTOISE.

INQUIRIES from various quarters have been made so repeatedly for the sequel to the brief story of a young two-headed tortoise, *Chrysemys picta*, published in the *American Journal of Science* for October, 1888, that the author is led to believe that a public account thereof will serve more useful ends than many private ones. In order that the sequel may be more intelligible to all, a brief resumé of the first paper will be given.

The young tortoise, hatched but a day or so, was found in the marshes bordering West River, New Haven, Conn. The carapace, which was somewhat broader than long and slightly distorted, bore the cus-

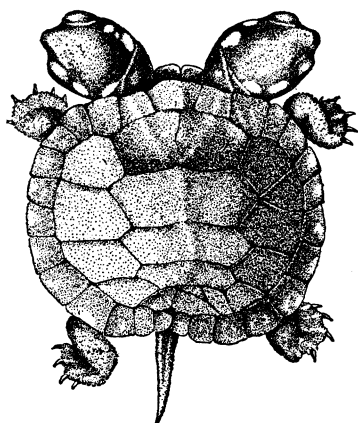


Fig. 1. Dorsal view of the two-headed tortoise *Chrysemys picta*.

tomary legs and tail, but there were two perfectly developed heads and necks.

The author visited and studied this little monstrosity almost daily for weeks. It lived and thrived and grew appreciably during that time. Its charm was in the very perfection of its imperfection. Such a oneness of two with individuality preserved is not to be found. In one carapace there were two alimentary systems, two nervous

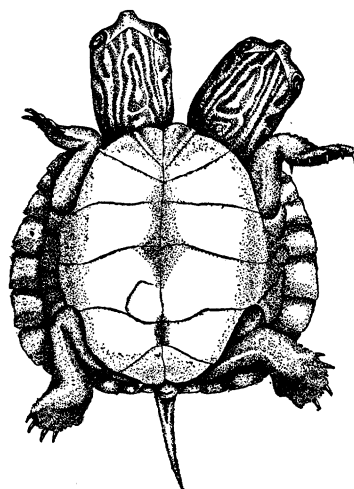


Fig. 2. Ventral view of the same.

systems, two respiratory and circulatory systems, two muscular and bony systems. Each was double in part at least. There were two wills, for the heads fought continually for the rights of their common shell and for their food.

There were two dispositions; the one quicker, more timid and more irascible; the other stolid. Each head could hear, see, eat, drink and breathe independently. Though afterwards acquired, there was originally no concerted action between the right side and the left. However, with surprising frequency, the two did act in unison, and simultaneously, as if there were correlation by a common nervous system.

They might, or they might not, each drink, sleep or swim, as each willed. When one side with its organs and appendages